

NOTICES OF FINAL RULEMAKING

The Administrative Procedure Act requires the publication of the final rules of the state's agencies. Final rules are those which have appeared in the *Register* first as proposed rules and have been through the formal rulemaking process including approval by the Governor's Regulatory Review Council or the Attorney General. The Secretary of State shall publish the notice along with the Preamble and the full text in the next available issue of the *Register* after the final rules have been submitted for filing and publication.

NOTICE OF FINAL RULEMAKING

TITLE 4. PROFESSIONS AND OCCUPATIONS

CHAPTER 48. ARIZONA UNIFORM PLUMBING CODE COMMISSION

PREAMBLE

1. Sections Affected

Rulemaking Action

R4-48-101	Amend
R4-48-103	Amend
Table A	Amend
R4-48-106	Amend
R4-48-107	Amend
R4-48-109	Amend
R4-48-112	Amend
Illustration A	New Illustration
R4-48-114	Amend
Table A	Amend
R4-48-122	Amend
R4-48-129	Amend
R4-48-130	New Section
R4-48-131	New Section
R4-48-132	New Section
R4-48-133	New Section
R4-48-134	New Section
R4-48-135	New Section
R4-48-136	New Section
R4-48-137	New Section
R4-48-138	New Section
R4-48-139	New Section
R4-48-140	New Section
R4-48-141	New Section
R4-48-142	New Section
R4-48-143	New Section
R4-48-144	New Section
R4-48-145	New Section
R4-48-146	New Section
R4-48-147	New Section

2. The statutory authority for the rulemaking, including both the authorizing statute (general) and the statutes the rules are implementing (specific):

Authorizing statute: A.R.S. § 41-619

Implementing statute: A.R.S. § 41-619

3. The effective date of the rules:

May 18, 2003

4. A list of all previous notices appearing in the Register addressing the final rules:

Notice of Rulemaking Docket Opening: 8 A.A.R. 3935, September 13, 2002

Notice of Proposed Rulemaking: 8 A.A.R. 4144, October 4, 2002

Notices of Final Rulemaking

5. The name and address of agency personnel with whom persons may communicate regarding the rulemaking:

Name: Brian Townsend, Chairperson
Address: Arizona Uniform Plumbing Code Commission
c/o Arizona Registrar of Contractors
800 W. Washington, 6th Floor
Phoenix, AZ 85007
Telephone: (602) 542-1525, ext. 7652
Fax: (602) 542-7852
E-mail: sharon.kowalski@roc1.rc.state.az.us

6. An explanation of the rules, including the agency's reasons for initiating the rules:

Over the past three years, the Arizona Uniform Plumbing Code Commission has adopted and amended the International Association of Plumbing and Mechanical Officials' (IAPMO) 1994 Uniform Plumbing Code (UPC), including its appendices and installation standards, as the state plumbing code.

On March 20, 2001, the Commission came together to produce a timeline and code amendment submittal guidelines for the public to submit amendments to the Arizona Uniform Plumbing Code (AUPC). The timeline and guidelines were distributed to potential proponents with a deadline for submittal of June 1, 2001. On July 9th and 10th 2001, the Commission met to review 15 submittals, of the 15, 11 of the submittals were approved, some with modifications.

7. A reference to any study relevant to the rules that the agency reviewed and either relied on in its evaluation of or justification for the rules or did not rely on in its evaluation of or justification for the rules, where the public may obtain or review each study, all data underlying each study, and any analysis of each study and other supporting material:

The Commission approved 11 submittals during the rulemaking process. Of these submittals, 7 contain documents that could be described as studies. The following is a list of the relevant submittals:

- Submittal #01, Air Admittance Valves
- Submittal #06, IPEX
- Submittal #07, IPEX
- Submittal #08, IPEX
- Submittal #14, Solvent Cement
- Submittal #15, CPVC Primer
- Submittal #17, Solvent Cement

These submittals are available at the Commission address listed in item #5.

8. A showing of good cause why the rules are necessary to promote a statewide interest if the rules will diminish a previous grant of authority of a political subdivision of this state:

The Arizona State Plumbing Code was initially adopted from a 1994 edition of the IAPMO Uniform Plumbing Code. Since this code's initial inception by International Association of Plumbing & Mechanical Officials in 1994, there has been much progress in new products and procedures in the plumbing field to date. In order to keep up with that progress, the Commission is submitting various amendments within each of the above-mentioned Sections.

9. The summary of the economic, small business, and consumer impact:

Although the Commission has proposed 15 changes to the AUPC, few of them have an economic impact on Arizona's consumers, businesses, small businesses, public and private employment, state revenues, administrative authorities, or political subdivisions. The following, by Section, are the reasons why they have little or no economic impact:

R4-48-103. Chapter 3, General Provisions, Section 316.1.5:

- **Impacted parties:** Cost impact would largely be limited to contractors where installation time could be reduced slightly because of using only one chemical solvent instead of two for making a joint.
- **Probable impacts on employment:** None
- **Probable impacts on state revenue:** None
- **Probable impacts on small business:** See "impacted parties"
- **Probable impacts on political subdivisions of the state:** None
- **Summary:** In general there would be no cost impact in order to implement a technology that is more user-friendly and better for the environment.

Notices of Final Rulemaking

R4-48-109. Chapter 9, Vents. Section 909.0, Special Vents:

To allow the use of this product by adopting this amendment would add no additional cost to construct buildings in southern Arizona. However, using traditional venting methods in a typical dwelling, instead of air admittance valves, would add approximately \$192 to \$321 to every new house built. This cost increase information is based on a report prepared for Studor Inc., titled "The Cost Comparison Between Installing Studor Air Admittance Valves (AAI's) or Extending Vents to the Outside," published January 9, 1995.

- Parties affected include the public home buyers, licensed plumbers, and owner-builders.
- Probable impact on employment is favorable, preventing layoff of plumbers and tradesmen.
- Probable impact on small business is favorable, preventing increased costs for licensed plumbers.
- Probable impact on state revenue is favorable, increasing tax revenues because of increased housing starts.
- Impact on political subdivision revenue is favorable because tax revenues will increase with increased housing starts.
- The air admittance valves are less intrusive and less costly.
- **Summary of the economic benefits:** This is one way of decreasing the costs of building an affordable home, improving the economic climate in the entire state.

R4-48-112. Chapter 12, Fuel Piping. Section 1211.3:

To permit the continued use of this practice by adopting this amendment would add no cost to the construction of buildings in southern Arizona. If this amendment is not adopted, the practice would forbid gas fixtures in island locations for buildings in southern Arizona.

- Parties affected include the public home buyers, licensed plumbers, and owner-builders.
- Probable impact on employment is an increase statewide.
- Probable impact on small business is increasing revenues by providing an option.
- Probable impact on state revenue is increased tax revenues because of increased housing starts.
- Impact on political subdivision revenue is increased tax revenues because of increased housing starts.
- The air admittance valves are less intrusive and less costly.
- **Summary of the economic benefits:** This is one way of providing for modern design methods for an affordable home, improving the economic climate in the entire state.

R4-48-145. Installation Standards, Section 301.1.2.3.2 Color; and Section 316.1.2 Procedures:

- **Impacted parties:** Cost impact would largely be limited to contractors if installation time could be reduced slightly because of using only one chemical solvent instead of two for making a joint.
- **Probable impacts on employment:** None
- **Probable impacts on state revenue:** None
- **Probable impacts on small business:** See "impacted parties"
- **Probable impacts on state revenue:** None
- **Probable impacts on political subdivisions of the state:** None
- **Summary:** In general, there would be no cost impact in order to implement a technology that is more user-friendly and better for the environment.

The following two groups of amendments were also accepted:

GROUP 1:

R4-48-103. Chapter 3, General Provisions, Table A, Materials and Types of Joints (Horizontal and Vertical);

R4-48-106. Chapter 6, Water Supply and Distribution, Section 604.1; and

R4-48-114. Chapter 14, Referenced Standards, Table A, Plumbing Material Standards:

Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) and Polyethylene-Aluminum-Polyethylene (PE-AL-PE) Composite Piping. Presumably consumers and businesses act in their own best interests and choose an available alternative, such as Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) and Polyethylene-Aluminum-Polyethylene (PE-AL-PE) Composite Piping, that best suits their individual purposes. Thus, as the range of alternatives available to consumers or businesses expands, they would presumably only choose one of the new alternatives because they deem it best suits their needs. Consequently, if the range of alternatives available to consumers and business increases, it cannot have a negative economic impact.

Notices of Final Rulemaking

GROUP 2:

R4-48-122. Appendix D, Rainwater Systems, Section D 1 (a) Materials:

- **Impacted Parties:** Impacted parties are, generally, those paying the costs of construction whether that be private parties or government. Use of plastic drain waste vent (DWV) will, generally, lower construction costs.
- **Probable impacts on employment:** Impacts would be relatively small except that plastic pipe is made in Arizona and cast iron pipe is not. Some jobs might be created in the manufacturing sector and potentially within the installation sector.
- **Probable impacts on small business:** Plastic pipe manufacturers in Arizona and plumbing contractors would be classified as small businesses. Both potentially would benefit. No small businesses would be impacted negatively. Construction costs for small businesses could be lower.
- **Probable impacts on state revenues:** No impact would be foreseen.
- **Probable impacts on political subdivisions of the state:** No impact would be foreseen.
- **Summary:** In general, cost impacts would be positive. Plastic DWV costs less than the alternatives and this would positively affect the overall costs of construction. Arizona companies make plastic pipe and would be able to sell more pipe in Arizona. There is a shortage of qualified plumbers in most of the nation, including Arizona. Being able to install more pipe with the same number of employees (plumbers) would be a direct benefit to contractors and others relying on building contracting by being able to move building along more quickly.

10. A description of the changes between the proposed rules, including supplemental notices, and final rules (if applicable):

The following changes were made between the proposed rule publication and this final rulemaking:

Changed to	Reason
This item is corrected to read: Air Admittance Valves for Plumbing Drainage Systems, ASSE Standard 1051: R4-48-109. Chapter 9, Vents, page 15.	Item Number 13 of this Preamble, "Air Admittance Valves for Plumbing Drainage Systems, ASSE Standard 1051: R4-48-109. Chapter 9, Referenced Standard, page 15 was incorrectly listed.
Minor grammatical and stylistic changes were made at the request of the Governor's Regulatory Review Council Staff.	Revise the rules to make them more clear and concise.

11. A summary of the comments made regarding the rules and the agency response to them:

None

12. Any other matters prescribed by statute that are applicable to the specific agency or to any specific rule or class of rules:

None

13. Incorporations by reference and their location in the rules:

Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems, ASTM D 2846/D 2846M-99:

R4-48-103. Chapter 3, General Provisions, page 13 [in original paper copy filed with the Secretary of State]

Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings, ASTM F493-97:

R4-48-103. Chapter 3, General Provisions, page 13 [in original paper copy filed with the Secretary of State]

Air Admittance Valves for Plumbing Drainage Systems, ASSE Standard 1051:

R4-48-109. Chapter 9, Vents, page 15 [in original paper copy filed with the Secretary of State]

Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe, ASTM F1281-02e1:

R4-48-114. Chapter 14, Referenced Standards, page 18 [in original paper copy filed with the Secretary of State]

Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe, ASTM F 1282-02e1:

R4-48-114. Chapter 14, Referenced Standards, page 18 [in original paper copy filed with the Secretary of State]

Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Crosslinked Polyethylene/Aluminum/ Cross-linked Polyethylene Composite Pressure Pipe, ASTM F1974-01e1:

R4-48-114. Chapter 14, Referenced Standards, page 18 [in original paper copy filed with the Secretary of State]

Arizona Administrative Register / Secretary of State
Notices of Final Rulemaking

14. Were these rules previously made as emergency rules?

No

15. The full text of the rules follows:

TITLE 4. PROFESSIONS AND OCCUPATIONS

CHAPTER 48. ARIZONA UNIFORM PLUMBING CODE COMMISSION

ARTICLE 1. ARIZONA UNIFORM PLUMBING CODE

Section

- R4-48-101. Chapter 2, Definitions
- R4-48-103. Chapter 3, General Provisions
 - Table A. Materials and Types of Joints (Horizontal and Vertical)
- R4-48-106. Chapter 6, Water Supply and Distribution
- R4-48-107. Chapter 7, Sanitary Drainage
- R4-48-109. Chapter 9, Vents
- R4-48-112. Chapter 12, Fuel Piping
- Illustration A. Gas Pipe Installation
- R4-48-114. Chapter 14, Referenced Standards
 - Table A. Plumbing Material Standards
- R4-48-122. Appendix D, Rainwater Systems
- R4-48-129. ~~Installation Standards~~ Installation Standard for Non-metallic Building Sewers
- R4-48-130. Installation Standard for Tile-lined Roman Bathtubs
- R4-48-131. Installation Standard for Copper Plumbing Tube, Pipe, and Fittings
- R4-48-132. Installation Standard for Tile-lined Shower Receptors (and Replacements)
- R4-48-133. Installation Standard for ABS Building Drain, Waste, and Vent Pipe and Fittings
- R4-48-134. Installation Standard for Hubless Cast Iron Sanitary and Rainwater Systems
- R4-48-135. Installation Standard for Polyethylene (PE) Cold Water Building Supply
- R4-48-136. Installation Standard for PVC Cold Water Building Supply and Yard Piping
- R4-48-137. Installation Standard for PVC Building Drain, Waste and Vent Pipe and Fittings
- R4-48-138. Installation Standard for Poly (Vinyl Chloride) (PVC) Natural Gas Yard Piping
- R4-48-139. Installation Standard for ABS Sewer Pipe and Fittings
- R4-48-140. Installation Standard for Polyethylene (PE) for Gas Yard Piping
- R4-48-141. Installation Standard for Protectively Coated Pipe
- R4-48-142. Installation Standard for Asbestos Cement Pressure Pipe for Water Service and Yard Piping
- R4-48-143. Installation Standard for Low Pressure Air Test for Building Sewers
- R4-48-144. Installation Standard for Extra Strength Vitrified Clay Pipe in Building Drains
- R4-48-145. Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems
- R4-48-146. Installation Standard for Welded Copper and Copper Alloy Water Tube
- R4-48-147. Installation Standard for PEX-AL-PEX and PE-AL-PE

ARTICLE 1. ARIZONA UNIFORM PLUMBING CODE

R4-48-101. Chapter 2, Definitions

- A. The following definition applies in this Article: "Person" has the meaning set forth in A.R.S. § 1-215.
- B. The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:
 - 1. Sec. 202.0 Add a definition for "Air Admittance Valve" which reads:
Air Admittance Valve means a one-way valve designed to allow air to enter the plumbing drainage system when negative pressure develops in the piping system.
 - ~~1-2.~~ Sec. 202.0. Modify the definition of "Insanitary" by replacing numbered paragraphs (2) and (3) with the following:
 - (2) Any opening in a drainage system, except where lawful, which is not provided with an approved liquid sealed trap.
 - (3) Any plumbing fixture or other waste discharging receptacle or device, which is not supplied with water sufficient to flush it and maintain it in a clean condition except those specifically designed to function without water.
 - ~~2-3.~~ Sec. 202.0. Add a definition for "PEX" which reads: "PEX means Cross-linked Polyethylene."
 - 4. Sec. 202.0 Add the following definition:
PE-AL-PE – Polyethylene-Aluminum-Polyethylene
 - 5. Sec. 202.0 Add the following definition:
PEX-AL-PEX – Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene

Notices of Final Rulemaking

R4-48-103. Chapter 3, General Provisions

A. No change

B. The Uniform Plumbing Code incorporated in R4-48-102(A), is modified as follows:

1. No change
2. No change
3. No change
4. No change
5. No change
6. No change
7. No change
8. No change
9. No change
10. No change
11. No change
12. No change
13. No change
14. No change
15. No change
16. No change
17. No change
18. No change
19. No change
20. No change
21. No change
22. No change
23. No change
24. No change
25. No change
26. No change
27. No change
28. No change
29. No change
30. No change

31. Add 3 new rows to Table 3-1. Refer to Table A – Materials and Types of Joints (Horizontal and Vertical):

32. Sec. 316.1.5 is modified to read:

Solvent Cement Plastic Pipe Joints. Plastic pipe and fittings designed to be joined by solvent cementing shall comply with appropriate IAPMO Installation Standards.

ABS pipe and fittings shall be cleaned and then joined with listed solvent cement(s).

CPVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cement(s).

Exception: Listed solvent cements that do not require the use of a primer shall be permitted for use with CPVC pipe and fittings 1/2" through 2" in diameter, manufactured in accordance with ASTM D 2846/D 2846M-99, which is incorporated by reference and published by American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. This incorporation by reference does not include any later amendments or editions.

PVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cement(s) conforming to ASTM F 493-97, which is incorporated by reference and published by American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. This incorporation by reference does not include any later amendments or editions.

Table A. Materials and Types of Joints (Horizontal and Vertical)

Materials	Type of Joints	Horizontal	Vertical
PEX	Mechanical	One inch (25.4mm) and smaller, Three feet (0.9 m), 1-1/4 inch (31.8mm) and larger four feet (1.2 m).	Base and each floor. Provide mid-story guides.
<u>PE-AL-PE</u>	<u>Mechanical</u>	<u>One inch (25.4 mm) and smaller, 98 inches (2489 mm)</u>	<u>Base and each floor. Provide mid-story guide.</u>
<u>PEX-AL-PEX</u>	<u>Mechanical</u>	<u>One inch (25.4 mm) and smaller, 98 inches (2489 mm)</u>	<u>Base and each floor. Provide mid-story guide.</u>

R4-48-106. Chapter 6, Water Supply and Distribution

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. No change
2. No change
3. Sec. 604.1 is modified to read:
Water pipe and fittings shall be of brass, copper, cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel, or other approved materials. Asbestos-cement, CPVC, PE, PEX, PEX-AL-PEX, PE-AL-PE, or PVC water pipe manufactured to recognized standards may be used for cold water distribution systems outside a building, CPVC, ~~or PEX, or PEX-AL-PEX~~ water pipe and tubing may be used for hot and cold water distribution systems within a building. PE-AL-PE water pipe may be used for cold water distribution systems within a building. All materials used in the water supply system, except valves and similar devices shall be of a like material, except where otherwise approved by the Administrative Authority.
4. No change
5. Sec. 604.12 is added to read:
Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) and Polyethylene-Aluminum-Polyethylene (PE-AL-PE) composite piping shall be marked with appropriate designation or designations consistent with the fitting system or systems for which the piping has been listed or approved. PEX-AL-PEX and PE-AL-PE piping shall be installed with mechanical joints in compliance with the appropriate standards and the manufacturer's instructions.
- ~~5-6.~~ No change
- ~~6-7.~~ No change
- ~~7-8.~~ No change

R4-48-107. Chapter 7, Sanitary Drainage

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Section 701.1.2 is deleted.
- ~~1-2.~~ No change
 - (a) No change
 - (b) No change
 - (c) No change
- ~~2-3.~~ No change
- ~~3-4.~~ No change
- ~~4-5.~~ No change
- ~~5-6.~~ No change

R4-48-109. Chapter 9, Vents

~~This chapter has no modifications.~~

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 903.1.2 is deleted.
2. Sec. 909.0 is modified to read:
Special Venting
909.1 Air Admittance Valve
909.1.1 Vent systems utilizing air admittance valves shall comply with this section. Individual and branch-type air admittance valves shall conform to ASSE Standard 1051, which is incorporated by this reference and published by the American Society of Sanitary Engineering for Plumbing and Sanitary Research, 28901 Clemens Rd, Ste. 100, Westlake, OH 44145. This incorporation by reference does not include any later amendments or editions. This device shall close by gravity and seal the vent terminal at zero differential pressure (no flow condition) and under positive internal pressure. The air admittance valve provides a method of allowing air to enter the plumbing drainage system without the use of a vent extending to the open air and prevents sewer gases from escaping into the building.
909.1.2 The valves shall be installed in accordance with this section and the manufacturer's installation instructions. Air admittance valves shall be installed after the drain, waste, and vent testing required by Sections 712.2 or 712.3 has been approved by the administrative authority.
909.1.3 Individual and branch vents shall be permitted to terminate with a connection to the air admittance valve. The air admittance valve shall only be permitted to vent fixtures on the same floor, which connect to a building drain.
909.1.4 The air admittance valve shall be located at least 4" (102 mm) above the horizontal branch drain, or fixture drain being vented, within the maximum developed length permitted for the vent, and shall terminate at least 6" (152 mm) above insulation materials.

Notices of Final Rulemaking

909.1.5 The air admittance valve shall be accessible for the purpose of maintenance or replacement. The valve shall be located within a space that allows air to enter the valve.

909.1.6 The air admittance valve shall be rated for the size of the vent to which it is connected.

909.1.7 Within each plumbing system utilizing air admittance valves, a minimum of one vent stack shall extend outdoors to the atmosphere.

909.1.8 Air admittance valves shall not be installed in special waste systems, as described in Chapter 8, nor in spaces used as supply or return air plenums.

909.2 Island Fixtures

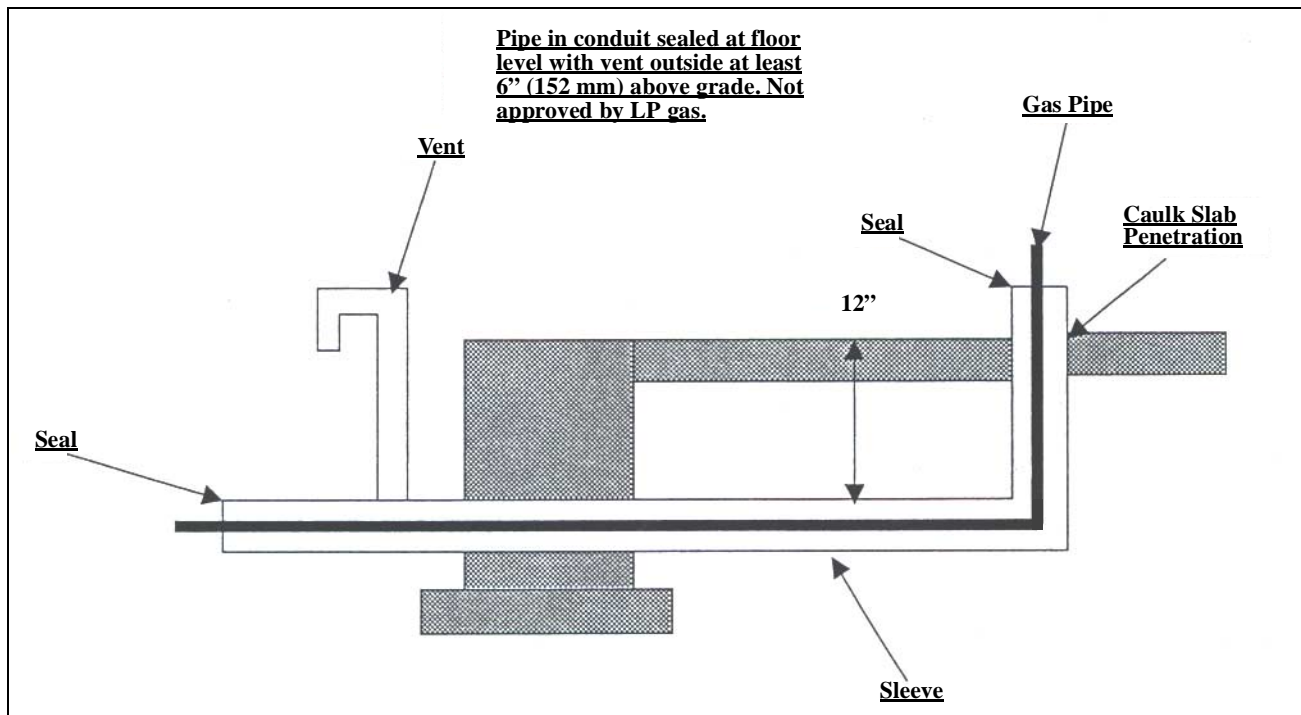
Traps for island sinks and similar equipment shall be roughed in above the floor and may be vented by extending the vent as high as possible, but not less than the drainboard height and then returning it downward and connecting it to the horizontal sink drain immediately downstream from the vertical fixture drain. The return vent shall be connected to the horizontal drain through a wye-branch fitting and shall, in addition, be provided with a foot vent taken off the vertical fixture vent by means of a wye-branch immediately below the floor and extending to the nearest partition and then through the roof to the open air or may be connected to other vents at a point not less than 6" (152.4 mm) above the flood level rim of the fixtures served. Drainage fittings shall be used on all parts of the vent below the floor level and a minimum slope of 1/4" per foot (21 mm/m) back to the drain shall be maintained. The return bend used under the drainboard shall be a one piece fitting or an assembly of a 45°, a 90°, and a 45° elbow in the order named. Pipe sizing shall be as elsewhere required in this Code.

R4-48-112. Chapter 12, Fuel Piping

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 1210.1 is modified to read: All pipe used for the installation, extension, alteration, or repair of any gas piping shall be standard weight wrought iron or steel (galvanized or black) or yellow brass (containing not more than 75% copper) or listed corrugated stainless steel tubing systems for interior use only. Approved PE pipe may be used in exterior buried piping systems. Exception: CSST piping installed outside a building shall be sleeved, or shall be installed with protection from mechanical damage equivalent of that required for CSST piping within the building. When installed underground CSST shall be sleeved and shall have a minimum burial depth of 18" (457.2 mm).
2. Sec. 1211.3 modify the exception to read:
Exception: when necessary due to structural conditions, approved type gas piping may be installed in other locations, when permission has first been obtained from the administrative authority. Natural gas piping (L.P. gas piping excluded) may be installed under a slab in accordance with Illustration A when building conditions prevent above-slab installation.

Illustration A. Gas Pipe Installation



Notices of Final Rulemaking

R4-48-114. Chapter 14, Referenced Standards

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Table 14-1. Add standards in alphabetical order listed under appropriate sections. Refer to Table A - Plumbing Material Standards. These standards are incorporated by reference. This incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are on file with the Arizona Uniform Plumbing Code Commission and the Office of the Secretary of State.

Add three new rows to Table A. Refer to Table A – Plumbing Material Standards.

Table A. Plumbing Material Standards

Materials and Products	ANSI	ASTM	FS	IAPMO	Other Standards	Foot-note Remarks
<u>NONMETALLIC PIPE:</u> <u>Crosslinked Polyethylene-Aluminum-</u> <u>Crosslinked Polyethylene (PEX-AL-PEX)</u> <u>Pressure Pipe</u>		<u>F1281-01e1 *</u>		<u>C-3388</u>	<u>NSF 14</u> <u>NSF 61</u>	
<u>Polyethylene-Aluminum-Polyethylene (PE-</u> <u>AL-PE) Pressure Pipe</u>		<u>F1282-02e1 *</u>		<u>C-3389</u>	<u>NSF 14</u> <u>NSF 61</u>	
<u>Metal insert fittings for Polyethylene-Alumi-</u> <u>num-Polyethylene (PE-AL-PE) and</u> <u>Crosslinked Polyethylene-Aluminum-</u> <u>Crosslinked Polyethylene (PEX-AL-PEX)</u> <u>Composite Pressure Pipe</u>		<u>F1974-01e1 *</u>		<u>C-3846</u>	<u>NSF 14</u> <u>NSF 61</u>	
NONMETALLIC PIPE: Metal insert fittings utilizing a copper crimp ring for SDR9 Cross-Linked Polyethylene (PEX) tubing. Cold Expansion Fitting with PEX reinforcing ring for use with SDR-9 Cross-Linked Poly- ethylene (PEX Tubing).		F1807-97 F1960-99				
PLUMBING FIXTURES: Waterless Urinals	Z124. 9			C-3346		
<u>Note:</u> <u>* Published by the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA</u> <u>19428-2959.</u>						

R4-48-122. Appendix D, Rainwater Systems

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Appendix D 1 (a) is modified to read:

Rainwater piping placed within the interior of a building or run within a vent or shaft shall be of cast iron, galvanized steel, wrought iron, brass, copper, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, or other approved materials, and changes in direction shall conform to the requirements of Section 706.0.

1-2. No change

2-3. No change

(a) No change

(b) No change

(c) No change

R4-48-129. ~~Installation Standards~~ Installation Standard for Non-metallic Building Sewers

This installation standard has no modifications.

R4-48-130. Installation Standard for Tile-lined Roman Bathtubs

This installation standard has no modifications.

R4-48-131. Installation Standard for Copper Plumbing Tube, Pipe, and Fittings

This installation standard has no modifications.

R4-48-132. Installation Standard for Tile-lined Shower Receptors (and Replacements)

This installation standard has no modifications.

Notices of Final Rulemaking

R4-48-133. Installation Standard for ABS Building Drain, Waste, and Vent Pipe and Fittings

This installation standard has no modifications.

R4-48-134. Installation Standard for Hubless Cast Iron Sanitary and Rainwater Systems

This installation standard has no modifications.

R4-48-135. Installation Standard for Polyethylene (PE) Cold Water Building Supply

This installation standard has no modifications.

R4-48-136. Installation Standard for PVC Cold Water Building Supply and Yard Piping

This installation standard has no modifications.

R4-48-137. Installation Standard for PVC Building Drain, Waste and Vent Pipe and Fittings

This installation standard has no modifications.

R4-48-138. Installation Standard for Poly (Vinyl Chloride) (PVC) Natural Gas Yard Piping

This installation standard has no modifications.

R4-48-139. Installation Standard for ABS Sewer Pipe and Fittings

This installation standard has no modifications.

R4-48-140. Installation Standard for Polyethylene (PE) for Gas Yard Piping

This installation standard has no modifications.

R4-48-141. Installation Standard for Protectively Coated Pipe

This installation standard has no modifications.

R4-48-142. Installation Standard for Asbestos Cement Pressure Pipe for Water Service and Yard Piping

This installation standard has no modifications.

R4-48-143. Installation Standard for Low Pressure Air Test for Building Sewers

This installation standard has no modifications.

R4-48-144. Installation Standard for Extra Strength Vitrified Clay Pipe in Building Drains

This installation standard has no modifications.

R4-48-145. Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. IS 20-93, Sec. 301.1.2.3.2 Color, is modified to read:
Color. Solvent cements requiring the use of a primer, shall be colored orange. Solvent cements that do not require the use of a primer shall be colored yellow.
2. IS 20-93, Sec. 316.1.2 Procedures, steps 5 through 7 are modified to read:
Step 5. Apply CPVC primer (see Section 316.1.1.1) to inside of fitting socket. Take care to avoid puddling.
Note: If listed, single-step cement is utilized, this step may be eliminated.
Step 6. Apply CPVC primer to outside surface of pipe to depth of fitting socket.
Note: If listed, single-step cement is utilized, this step may be eliminated.
Step 7. Wait until primer surface is tacky. DO NOT attempt to soften (dissolve) the surface as is required for PVC.
Note: If listed, single-step cement is utilized, this step may be eliminated.

R4-48-146. Installation Standard for Welded Copper and Copper Alloy Water Tube

This installation standard has no modifications.

R4-48-147. Installation Standard for PEX-AL-PEX and PE-AL-PE

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Add a new installation standard for PEX-AL-PEX and PE-AL-PE:

**COMPOSITE PEX-AL-PEX HOT AND PE-AL-PE COLD
WATER-DISTRIBUTION SYSTEMS**

This Standard shall govern the installation of composite piping in potable hot and cold water distribution systems within and under buildings and shall apply only to PEX-AL-PEX and PE-AL-PE piping meeting the requirements of ASTM F 1281-02e1 and ASTM F 1282-02e1. Installation, materials, and inspection shall comply with the 1994 edition of the Uniform Plumbing Code as modified by this Chapter, published by the International Association of Plumbing and Mechanical Officials, and shall also comply with this standard and manufacturer's installation recommendations.

NOTE: The following sections of the Uniform Plumbing Code shall apply to composite PEX-AL-PEX and PE-AL-PE piping.

- 301.0 Materials – Standards and Alternates
- 310.0 Workmanship
- 313.0 Protection of Piping, Materials, and Structures
- 314.0 Hangers and Supports
- 316.1.4 Flexible Compression Factory Fabricated Joints
- 316.2.3 Plastic Pipe to Other Materials
- 606.0 Joints and Connections
- 608.0 Water Pressure, Pressure Regulators, and Pressure Relief Valves

Notices of Final Rulemaking

609.0 Installation, Unions, and Location

610.0 Size of Potable Water Piping

Note: The following clauses are the Installation Standard. Note that the Section numbers 301, 313, 314, 316, 606, 608, 609, and 610 relate to the sections of the UPC but the specific clause numbers of this Installation Standard are not intended to match the UPC.

Chapter 2 DEFINITIONS

ASTM American Society for Testing and Materials

IAPMO International Association of Plumbing and Mechanical Officials

PEX-AL-PEX Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene

PE-AL-PE Polyethylene-Aluminum-Polyethylene

UPC Uniform Plumbing Code as published by IAPMO

301.0 Materials – Standards and Alternates

301.1 Minimum Standards

301.1.1 Materials – Materials shall comply with the following requirements:

<u>Materials</u>	<u>ASTM Standard</u>
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Crosslinked Polyethylene-
Aluminum-Crosslinked

Polyethylene (PEX-AL-PEX) F 1281-02e1

Polyethylene-Aluminum-
Polyethylene (PE-AL-PE) F 1282-02e1

Metal Insert Fittings for
PEX-AL-PEX and PE-AL-PE

composite pipe F 1974-01e1

301.1.1.1 Piping – PEX-AL-PEX composite pipe shall comply with ASTM F 1281-02e1.

PE-AL-PE composite pipe shall comply with ASTM F 1282-02e1.

301.1.1.2 Fittings – Fittings shall be metal insert type and shall comply with ASTM F 1974-01e1.

Manufacturers of fittings shall recommend assembly procedures. Fittings are limited to the following types:

(a) Insert fittings or compression type fittings.

(b) Special listed fittings of other types - Connections to galvanized pipe or fittings shall be specifically designed for that purpose.

301.1.2 Markings

301.1.2.1 Piping – Composite piping shall be legibly marked at intervals of not more than 5' (1.5m) with at least the following:

(a) Manufacturer's name or trademark;

(b) ASTM F 1281-02e1(PEX-AL-PEX) or F 1282-02e1(PE-AL-PE);

(c) Piping size;

(d) Material type – PEX-AL-PEX or PE-AL-PE;

(e) Pressure ratings at 125 psi (862 kPa) at 180° F (82° C) (PEX-AL-PEX)* or, 200psi (1380 kPa) at 73° F (23° C) (PE-AL-PE)*

(f) Mark of an acceptable certification agency;

(g) Manufacturer's date and material code

* The elevated temperature and pressure ratings for PEX-AL-PEX and PE-AL-PE in accordance with ASTM F1281-02e1 and ASTM F1282-02e1 are:

<u>PEX-AL-PEX</u> <u>(orange colored)</u>	<u>200 psi at</u> <u>73° F</u>	<u>125 psi at</u> <u>180° F</u>
<u>PE-AL-PE</u> <u>(blue colored)</u>	<u>200 psi at</u> <u>73° F</u>	<u>160 psi at</u> <u>140° F</u>

301.1.2.2 Fittings – Fittings shall be marked with at least the following:

(a) Manufacturer's name or trademark or other acceptable markings; and

(b) Fittings shall be labeled with the mark of an acceptable certification agency.

(c) If size permits, ASTM F1974-01e1.

301.1.2.3 Position of Markings – When practical, markings shall be visible for inspection. Markings shall be visible prior to installation.

313.0 Protection of Piping, Materials, and Structures

313.1 Abrasion – Piping passing through metallic studs, joists, or hollow masonry walls shall be protected from abrasion or sharp edges by elastomeric or plastic sleeves, grommets, conical shaped punch holes or other approved means.

313.2 Puncture – Steel plate protection, minimum 18 gauge, shall be installed when the piping is within 1" (25 mm) of the nailing surface.

Notices of Final Rulemaking

313.3 Exposed Piping

313.3.1 General – Where exposed piping may be subjected to mechanical damage it shall be protected.

313.4 Freezing – In areas where the system must be drained to protect the system from freezing, horizontal lines shall be graded to drain.

313.5 Storage – Piping shall be stored in a way to protect the system from mechanical damage (slitting, puncturing, etc.). Piping should be stored undercover to keep it clean and avoid long term exposure to sunlight. Consult piping manufacturer for recommended limits for outside storage.

313.6 Thermal Expansion

313.6.1 General – The linear expansion rate for PEX-AL-PEX and PE-AL-PE is 1.56" (39.6 mm) per 100' (30m) of tube per 100° F (55° C) change in temperature. No accommodation for thermal expansion is required.

313.6.2 Clearance – Bored holes and sleeves shall provide adequate clearance between the piping and structure to allow for free longitudinal movement.

314.0 Hangers and Supports

314.1 Vertical Piping – Vertical piping shall be supported at every floor. Piping shall have a mid-story guide.

314.2 Horizontal Piping – Horizontal piping shall be supported according to the following Table A.

Table A. Support Spacing

<u>Nominal Diameter</u>	<u>Spacing</u>
<u>1/2", 3/4", and 1"</u>	<u>8' 2" (2489 mm)</u>

314.3 Hangers and Anchors – Piping shall not be anchored rigidly to a support; but shall be secured with hangers or straps that provide for a degree of movement and that prevent damage to the piping. Do not use hangers or straps with sharp or abrasive edges. Do not use hangers that pinch the piping.

314.4 Inspection and Testing

A. Inspection – All piping shall be properly seated on to the fitting per the manufacturer instructions. Buckled, gouged or obviously damaged pipe shall not be used. Consult manufacturer recommendations for repair procedures.

B. Testing – Upon completion of a section or of the entire hot and cold water supply system it shall be tested and proved tight under a water pressure or air test not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source. The system shall withstand the test without leaking for a period of not less than 15 minutes.

316.0 Joints and Connections

316.1 Joints and Connections

316.1.1 Procedure – Piping shall be cut with a pipe cutter designed specifically for composite pipe. Piping shall be cut square, i.e. perpendicular to the length. If other cutting methods are used, care shall be taken to remove any excess material, flashing, or burrs.

316.1.2 Tools – The manufacturer's recommend fitting tool shall be used with the composite insert fitting systems. For specific procedures, follow the manufacturer's recommendations.

316.2 Special Joints

316.2.1 Fittings – Transitions for composite piping to metal piping or valves shall be made only with transition fittings intended for that purpose.

606.0 Joints and Connections

606.1 Joints – Joints shall not be allowed in piping installed in or under a concrete slab resting on grade unless for repair within a building structure. All repair joints shall be properly protected with a heat shrink sleeve. All slab penetrations shall be sleeved.

608.0 Water Pressure, Pressure Regulators, and Pressure Relief Valves

608.1 PEX-AL-PEX Piping – PEX-AL-PEX piping used for temperature or pressure relief valve drain lines shall be graded to the outlet end and shall be supported at a maximum of 8' 2" (2489 mm) interval horizontally. Vertical piping shall be supported at every floor. Vertical piping shall have a mid-story guide.

609.0 Installation, Unions, and Location

609.1 Bends – Piping shall be installed by bending the composite pipe by hand to a minimum radius of five times the nominal pipe diameter. External bend supports or sleeves are not required as the composite piping is rigid after bending.

609.2 Damage – Kinked, buckled, gouged, or other obviously damaged piping shall not be used.

609.3 Finish Nipples – Finish nipples shall be connected to drop ear fittings to prevent rotation. Finish nipples shall not be PEX.

609.4 Hose Bibs – The piping directly connected to any hose bib shall be so anchored that the load on the hose bib will not strain the composite piping.

609.5 Heated Joints – An open flame shall not be applied to PEX-AL-PEX or PE-AL-PE piping when brazing, soldering, or welding joints.

Notices of Final Rulemaking

609.6 Working Pressure and Temperature – Long-term working pressures for the PEX-AL-PEX shall not exceed a maximum of 115 psi (793 kPa) and the long-term working temperature shall not exceed 210° F (99° C). Long-term working pressures for the PE-AL-PE shall not exceed a maximum of 160 psi (1103.2 kPa) and the long-term working temperature shall not exceed 140° F (60° C).

609.7 Exposure to Sunlight – Only UV stabilized composite piping shall be subjected to direct sunlight after installation and shall be installed on the surface of the building. Kitec pipe contains an ultraviolet (UV) inhibitor to withstand limited exposure to UV light. Manufacturer recommends placing the unused portion of a Kitec coil back in the product's box rather than storing in the sunlight while not in use.

609.8 Water Heater Connections – PEX-AL-PEX or PE-AL-PE piping shall not be installed within the first 18" (457 mm) of piping connected to a water heater.

609.10 Water Hammer Arrestors – A composite hot water system shall withstand repeated pressure surges, well in excess of its rated pressure. The Arizona Uniform Plumbing Code requires a means of attenuating water hammer. Consequently water hammer arrestors may be advisable when solenoid valves or other quick closing devices are used in the system. In designing for these situations, it is advisable to consult the pipe or fittings manufacturer for recommended surge pressure limits. Water hammer and surge pressure calculations are reviewed in Chapter 7, AWWA Manual M-11.

610.1 Size of Potable Water Piping

610.1.1 Method – Piping shall be sized in accordance with a Arizona Uniform Plumbing Code Section 610.0.

When a Arizona Uniform Plumbing Code Appendix A is applicable, use Table B.

Add equivalent lengths from Table C when determining developed length.

Maximum velocities through PEX-AL-PEX and PE-AL-PE copper alloy fittings shall be limited to 8' per second (fps) (2.4 mps) in cold water and 5' per second (fps) (1.52 mps) in hot water.

Table B. Head Loss vs. Flow Rate

Flow Rate U.S. GPM	1/2"		3/4"		1"	
	Head Loss Psi/c.ft.	Velocity Ft/s	Head Loss Psi/c.ft.	Velocity Ft/s	Head Loss Psi/c.ft.	Velocity Ft/s
0.1	0.02	0.2	0.002	0.07	0.001	0.04
0.2	0.1	0.4	0.01	0.1	0.002	0.08
0.3	0.2	0.6	0.02	0.2	0.005	0.1
0.4	0.3	0.7	0.03	0.3	0.009	0.2
0.5	0.5	0.9	0.04	0.3	0.01	0.2
0.6	0.6	1.1	0.05	0.4	0.02	0.3
0.7	0.9	1.3	0.07	0.5	0.02	0.3
0.8	1.1	1.5	0.09	0.5	0.03	0.3
0.9	1.4	1.7	0.1	0.6	0.04	0.4
1.0	1.6	1.8	0.1	0.7	0.05	0.4
2.0	5.9	3.7	0.5	1.3	0.2	0.9
3.0	12.5	5.5	1.0	2.0	0.4	1.3
4.0	21.3	7.3	1.8	2.6	0.6	1.7
5.0			2.7	3.3	0.9	2.1
6.0			3.8	4.0	1.3	2.5
7.0			5.0	4.6	1.7	3.0
8.0			6.4	5.3	2.2	3.4
9.0			8.0	5.9	2.7	3.8
10.0			9.7	6.6	3.3	4.2
11.0			11.6	7.2	3.9	4.6
12.0			13.6	7.9	4.6	5.0
13.0					5.3	5.5
14.0					6.1	5.9
15.0					6.9	6.3
16.0					7.8	6.3
17.0					8.7	6.7
18.0					9.7	7.1
19.0					10.7	7.6
20.0					11.8	8.0

Notices of Final Rulemaking

Table C. Developed Length

<u>Sizes, Inches</u>	<u>Type of Fittings</u>	<u>Equivalent Length of Pipe (Feet)</u>
<u>1/2</u>	<u>Couplings</u>	<u>2</u>
	<u>Adapters</u>	<u>2</u>
	<u>Elbows</u>	<u>7.5</u>
	<u>Tees (Branch Flow)</u>	<u>8</u>
	<u>Tees (On the Run)</u>	<u>2.5</u>
<u>3/4</u>	<u>Couplings</u>	<u>2</u>
	<u>Adapters</u>	<u>2</u>
	<u>Elbows</u>	<u>8.5</u>
	<u>Tees (Branch Flow)</u>	<u>10.5</u>
	<u>Tees (On the Run)</u>	<u>2.5</u>
<u>1</u>	<u>Couplings</u>	<u>2</u>
	<u>Adapters</u>	<u>2</u>
	<u>Elbows</u>	<u>9</u>
	<u>Tees (Branch Flow)</u>	<u>11</u>
	<u>Tees (On the Run)</u>	<u>2.5</u>